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⑯ Container and lid.

⑰ A one-piece tightly fitting, molded plastic lid intended to be used in association with a container having a laterally-protruding lip extending about the perimeter of its mouth. In each embodiment of the invention the plastic lid is provided with a surrounding depending sidewall having a relatively thin upper web segment which is adapted to deform heightwise to conform to the shape of the protruding container lip as the lid is fitted onto the container. The lower region of the lid sidewall has a resilient skirt which is thicker than the web segment and thus has a greater elastic memory. The sidewall skirt stretches when forced over the protruding lip and then the skirt retracts radially inwardly closely adjacent to the outside wall of the container immediately below the lip to stretch the deformable web segment tightly over the lip to seal the mouth of the container.

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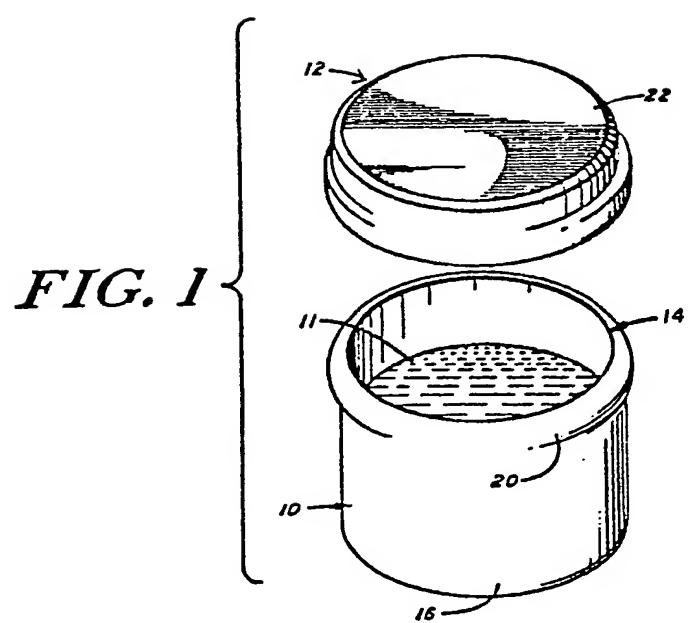
One aspect of the invention relates to the container which is formed with an integral, outwardly projecting lip about the rim. The cross-section of the lip is contoured to provide a smoothly curving surface of enlarged diameter about which the deformable web of the lid sidewall can be wrapped. In another, modified form of the invention, the container rim is provided with an additional, inwardly projecting lip which cooperates with a sealing ring on the lid in a manner which enhances the seal. This latter configuration additionally provides enhanced hoop strength for the container itself as well as for the combined container and lid.

In one embodiment of the invention the lid sidewall is smooth and shoulderless on its interior surface to facilitate the fit of the sidewall over the lip of the container. One lid may be used with a variety of container lips having different sizes, shapes and compositions.

In another embodiment of the invention the lid sidewall is provided with a shoulder on its interior surface which, when the lid is in place, will be disposed below the lip and may engage the underside of the lip to provide an additional interlock between the lid and container. In this embodiment, which preferably is used in connection with the container having an additional inwardly projecting lip, the lid is provided with a sealing ring which engages the inwardly projecting lip of the container in a manner which tends to bias the lid upwardly. The upward bias tends to draw the shoulder on the lid sidewall snugly against the underside of the container outer lip. This configuration provides additional hoop strength for the assembled lid and container as well as providing a superior seal and safety configuration.

In a modification of the invention the lid is provided with a self contained compressible gasket which, when the lid is seated on the container, effects an additional seal which further supplements the integrity of the seal and assures hermetic characteristics.

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CONTAINER AND LID

This invention relates generally to container closures and more particularly to one-piece tightly fitting, molded plastic lids for use with containers having a protruding lip around the periphery of the mouth.

This application is a continuation-in-part of my prior application serial number 379,746 filed May 19, 1982 and entitled CONTAINER LID.

Containers with snap-fitting, removable lids often are formed with a mouth defined by a peripheral lip and a channel which together are intended to provide a suitable seal with an associated lid. In most such containers, the lid is applied to the container at the factory to create a satisfactory seal. However, the user often removes the lid with a prying tool, such as a screwdriver, especially if the lid is metal, and this action results in deformation of the container and/or the lid in a manner which may disrupt the formation of a cooperative seal when the lid is later replaced. Such deformation often makes it difficult or impossible to reseal satisfactorily the container utilizing the same lid. As a result, the contents of the container may deteriorate, either hardening or evaporating. Leakage of the contents from the container or leakage of water or other liquids into the container also can occur, either damaging the surface upon which the container is placed or rendering the contents unusable.

A lid which satisfactorily overcomes many of the problems attendant to poor resealing is described in my U.S. Patent 4,279,358. The lid described in that patent has an inwardly-facing shoulder formed on its depending sidewall which engages the underside of the protruding lip on the container. That lid is particularly suited for use with certain size and shape container lips, and precise placement of the inwardly-facing shoulder is desirable for optimum seating of the lid.

1 One aspect of the invention relates to a configuration
for snap-fitting, one-piece, molded plastic lids which are
modifications of the lid described in my U.S. patent
4,279,358. Each lid configuration of this invention is
5 adapted for use with a container having a laterally
protruding peripheral lip, and is easily and inexpensively
molded, easily removed and provides a tight and secure
seal around the mouth of the container.

10 The lid includes a top wall and a sidewall which
depends from the periphery of the top wall. The upper
portion of the sidewall comprises a relatively thin,
deformable web segment which is stretchable heightwise.
The lower portion of the sidewall is contiguous with the
15 upper portion and comprises a skirt having a greater
radial thickness and greater elastic memory than the upper
web portion.

20 The container preferably is molded and has a specially
contoured rim extending about the container mouth. The
rim includes an outer lip which extends radially outwardly
away from the container sidewall. The outer lip is
smoothly rounded along its outer upper sealing surface
having a downwardly and outwardly sloping contour as it
approaches the greatest diameter of the lip. The contour
of the lip then extends inwardly toward the container
25 sidewall at a sharper angle. The upper sealing surface of
the lip cooperates with the stretchable web on the lid so
that the web will wrap about the upper sealing surface to
provide a seal.

30 In another aspect of the invention the container rim
also may have an inner lip which extends radially inwardly
from the inner surface of the container wall. The inner
lip has a downwardly and inwardly sloping inner seating
surface which cooperates with an inner sealing ring formed
on the lid. In this embodiment of the invention the
35 container rim is engaged both on the inside and the
outside by the lid and in a manner which enhances the seal

1 while also providing substantially increased hoop strength
for the container and lid individually and in combination.

5 In one embodiment of the lid, the inner surface of the
lid sidewall of the container is smooth and free of
interruptions, such as shoulders, along its height. The
inner diameter of the lid sidewall is smaller than the
10 outside diameter of the container lip and generally equal
to the outside diameter of the container. In another
embodiment of the lid, the sidewall is provided with a
shoulder which, when the lid is seated on the container,
will be disposed below the outer lip of the container to
provided added resistance to inadvertent removal.

15 In still another embodiment of the invention the lid
may be provided with a compressible ring of sealing
material which is carried by the lid and which will engage
the uppermost edge of the rim when the lid is seated.

20 In each embodiment of the invention, when the lid is
applied to the container, the inner surface of the
sidewall is advanced over the lip. Once the lower, skirt
portion of the sidewall has advanced past the lip, its
elastic memory causes it to contract radially inwardly
25 toward the container sidewall thereby stretching the thin
upper web segment of the sidewall around the lip of the
container drawing the web into conformity with the shape
of the lip. The contracted lower portion of the sidewall
thereafter remains immediately below the lip, tensioning
the upper web segment of the sidewall in engagement with
the lip. The elasticity of the lower skirt portion of the
30 sidewall maintains the seal and prevents the sidewall and
the cover from riding up over the container lip.

15 The lid may be provided with an inner sealing band or
ring which depends from the top wall and is adapted to
seat against the inner surface of the container opening by
the stretching of the lid sidewall over the container
lip. The sealing band is molded integrally with the lid
and is spaced radially inwardly from the lid sidewall.

1 The lid also may be provided with a plurality of
reinforcing ribs extending radially inwardly from the
.. sealing band.

5 The lid of this invention is reusable, without
destroying its sealing capabilities, for the life of the
elastic memory of the lower portion of the lid sidewall.

10 In the embodiment of the lid which has no internal
shoulder, the smooth interior surface of the sidewall
makes molding of the lid easy and fast and facilitates
application and removal of the lid. In addition, precise
dimensioning of the container lid to the lip is not
required and greater tolerances are permitted in forming
the lid since the lower portion of the sidewall is
sufficiently flexible to allow it to seat about the lip
15 even if the fit is not exact. Thus, with the shoulderless
embodiment one lid may be used with a variety of container
lips having different shapes, radial dimensions and formed
of different materials.

20 In other embodiments of the lid, which utilize a
shoulder on the inner surface of the lid sidewall, the
cooperation between the lid and the container is such that
the shoulder tends to become drawn upwardly into
engagement with the underside of the outer lip of the
container. Although the engagement of the shoulder with
25 the underside of the lip does not itself provide the
primary seal, it does lessen the chance of the cover
becoming dislodged inadvertently. To that end, this
embodiment of the lid incorporates a V-shaped inner ring
which is spaced radially inwardly from the periphery of
30 the lid. The outermost wall of the V-ring is spaced
slightly from the stretchable web on the lid sidewall and
cooperates with the web to define an annulus receptive to
the container rim. The configuration of the outer wall of
th V-ring and th web of the sidewall is such as to cause
35 a pinching or squeezing of the upper rim of th container
tending to bias the lid upwardly. The upward biasing

applied to the lid tends to draw the shoulder of the lid sidewall into engagement with the underside of the container outer lip. In addition the V-ring on the lid also enhances the hoop strength and distortion of the lid when it is apart from the container as well as when it is on the container. Still another advantage of this embodiment is that the V-ring provides for some flexibility in the lid which enables the lid to dome and flex without disrupting the seal between the web and container lip.

In a modification of the invention the lid may be provided with a compressible resilient gasket in the annulus which receives the container rim. The gasket is located and dimensioned with respect to the lid and rim so that it is compressed partially by the upper edge of the rim when the lid is on the container, thereby providing a supplemental and hermetic seal in addition to the primary seal effected by the cooperation between the web segment of the sidewall and the container outer lip.

It is among the general objects of the invention to provide improved containers, lids and cooperative sealing arrangements therefor. More particularly, it is among the general objects of the invention to provide containers and lids of the type described which may be of integral molded plastic construction yet which display superior sealing and security characteristics.

Another object of the invention is to provide a sealing system for a lid and container in which the integrity of the seal is not destroyed by repeated reuse of the lid and container.

The objects, advantages and features of this invention will be more clearly appreciated from the following detailed description taken in conjunction with the accompanying drawing in which:

FIG. 1 is a pictorial representation of a container and lid in accordance with the invention;

1 FIG. 2 is a partial sectional view of the container
lid and container of FIG. 1 prior to application of the
lid;

5 FIG. 3 is a partial sectional view of the lid and
container of FIG. 2 after application of the lid to the
container;

10 FIG. 4 shows an alternative embodiment of the
container of FIGS. 1-3;

15 FIG. 5 shows an alternative embodiment of the
container lip of the container of FIGS. 1-2;

20 FIG. 6 is a cutaway pictorial representation of one
embodiment of the lid of this invention.

25 FIG. 7 is a pictorial representation of a container
and lid in accordance with the modified embodiment of the
invention;

30 FIG. 8 is a partial sectional view of the container
lid and container as shown in FIG. 7 prior to application
of the lid and arranged to illustrate the relative
diameters of the operative lid and container elements;

35 FIG. 9 is a partial sectional view of the lid and
container of FIG. 8 after application of the lid to the
container;

40 FIG. 10 is an illustration of the modified form of the
lid incorporating a compressible gasket to effect a
supplemental seal;

45 FIG. 11 is an illustration of the lid shown in FIG. 10
applied under full pressure to the container; and

50 FIG. 12 is an illustration of the lid and container of
FIG. 10 with the applying pressure relaxed and
illustrating the retention of the supplemental seal.

55 FIGS. 1-3 illustrate one embodiment of each of an
exemplary container 10 and lid 12 incorporating an aspect
of this invention. Container 10 typically has a generally
cylindrical shape and the upper end of the container 10 is
provided with a mouth 11 which extends generally across
the entire diameter of the container. Mouth 11 is bounded

by a rim 14 region at the upper end of container sidewall 16 which may be formed integrally with or formed as a separate piece and secured to the upper end of sidewall 16. A surface 18 is formed at the rim region 14 on the inwardly facing side of the sidewall 16 and outer lip 20 is disposed on the outwardly facing side of the rim region 14. Lip 20 projects radially outwardly away from sidewall 16 of the container and extends around the entire periphery of mouth 11. Lip 20 preferably is smoothly rounded along its entire outer surface and is formed to define an upper seal surface 21 which slopes downwardly away from the top of the rim 14 until the point of greatest radial extent is reached (indicated at 23 in FIG. 2) after which it curves more abruptly inwardly along a lower seal surface 25 toward sidewall 16. Lip 20 may be molded with sidewall 16 or formed separately and attached integrally thereto.

In each embodiment of the invention the lid 12 is molded as a unitary piece and includes a top wall 22 and a sidewall 24 which depends downwardly from the periphery of top wall 22. Sidewall 24 is formed of two segments, an upper web segment 26 adjacent top wall 22 and a lower segment or skirt 28 spaced from top wall 22. In the embodiment shown in FIGS. 1-3 the inner diameters of skirt 28 and web segment 26 are substantially equal so that the inner surface of sidewall 24 is smooth and uninterrupted. The inner diameter of sidewall 24 is generally equal to outside diameter of container sidewall 16 and is less than the outside diameter of lip 20. Web segment 26 is relatively thin and is deformable in a heightwise or axial direction. Skirt 28 is substantially thicker than web segment 26, is not deformable in a heightwise direction, and possesses a much greater elastic memory. Both skirt 28 and web segment 26 are expandable in a radial direction. The lower edge of skirt 28 may be bevelled or smoothly curved as indicated at 30 to facilitate the

radial expansion of sidewall 24 as it is urged over the circumferential lip 20.

As shown in FIGS. 2 and 3, lid 12 is applied to container 10 by press-fitting it over rim 14. As the bevelled or smoothly curved lower edge 30 of lid sidewall 24 is urged downwardly against lip 20 of the container, the relatively thick skirt 28 is forced radially outwardly to expand as the lid is urged progressively downwardly onto the container. When skirt 28 has been advanced beneath lip 20, the elastic memory of the skirt 28 causes it to snap back to its original configuration and constrict radially inwardly about the container sidewall 16 until it seats against sidewall 16 beneath lip 20 as shown in FIG. 3. This elastic constricting force of skirt 28 causes web segment 26 to be stretched heightwise. When fully seated web segment 26 is in a thinner stretched configuration and is tightly and intimately wrapped about lip 20 causing web segment 26 to conform closely to the exterior shape of lip 20 to form a continuous seal. The heightwise stretching of web segment 26 over and around lip 20 by skirt 28 effectively inhibits lid 12 from rising upwardly and off container 10 and seals mouth 11.

As shown in FIGS. 2 and 3, lid 12 also may be provided with a sealing ring 32 which is usually molded integrally with the lid. Sealing ring 32 depends downwardly from the underside of top wall 22, is spaced radially inwardly from the outer perimeter of lid 12, and extends continuously around the lid parallel with the perimeter thereof. Sealing ring 32 is dimensioned so that it seats against surface 18 of container rim 14 when sidewall 24 is urged downwardly and stretched over lip 20. No channel is required in rim 14 for proper seating of ring 32, since the tight fit of sidewall 24 over lip 20 is sufficient to seat ring 32 against surface 18 and to seal mouth 11. The lack of such a channel prevents the accumulation of fluids between ring 32 and surface 18 which can prevent

1 th formation of a good seal and permits all fluids to
drip back into the container.

5 In a modification of the foregoing embodiment shown in
Fig. 6, lid 12 may be provided with a plurality of
radially extending ribs 39 on the underside of top wall
22. Ribs 39 typically extend from sealing ring 32
inwardly to another ring 37 radially spaced from ring 32
and concentric therewith. Ribs 39 are equally spaced in a
10 circumferential direction about rings 32 and 37 and
preferably decrease gradually in thickness normal to top
wall 22 moving from ring 32 to ring 37. Thus, the lower
radially extending surface of each rib 39 rises upward
15 toward top wall 22 going from ring 32 to ring 37 to
provide each rib with a trapezoidal cross-sectional
shape. Ribs 39 reinforce top wall 22 and prevent top wall
22 from being deformed radially inwardly or outwardly and
they help preserve the seal between lid 12 and mouth 11.
Ring 32 also prevents radial deformation of lid 12, thus
20 providing a more secure seal, especially in impact
situations, by maintaining the circular shape of lid 12.
Ribs 39 maintain the flat configuration of top wall 22 and
prevent it from warping, thus minimizing splaying of
sidewall 24 and providing a secure seal. Ribs 39 and
25 rings 32 and 37 are formed of the same material as the lid
and add little extra weight thereto.

30 Alternative embodiments of the container and lid
configurations are shown in FIGS. 4 and 5. Since the
containers and lids illustrated in FIGS. 4 and 5 are
identical in some general respects to those of FIGS. 1-3,
like numbers are used for like parts for convenience. In
FIG. 4, exterior sidewall 16 of container 10 is provided
with an indentation 50 formed immediately below lip 20.
In this embodiment the inner diameter of skirt 28 is
35 slightly less than that of the outside diameter of
container sidewall 16, so that as skirt 28 is forced over
lip 20, its elastic memory causes skirt 28 to retract

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1 sufficiently to reside within indentation 50. Indentation
50 conforms to the shape of the inner wall of skirt 28 in
its seated condition, so that skirt 28 seats securely and
tightly within indentation 50. This seating of skirt 28
5 within indentation 50 produces a greater heightwise
stretching of web segment 26, thereby providing a tighter
fit of lid 12 on container 10 and providing a more secure
seal.

10 FIG. 5 illustrates the application of this invention
to a container having a lip 52 similar in shape and
dimension to that found on conventional metal, wide-mouth
paint containers. Lip 52 is provided with a less rounded,
more sharply angled, top and undersurface than lip 20 and
is also provided with a lesser radial dimension with
15 respect to the container sidewall. Typically, the radial
dimension of lip 52 measured in its protrusion from
container sidewall 16 is about one-half as great as that
of the type of lip illustrated at 20 in FIGS. 1-4.

20 The lid and container of this invention have several
advantages over the lid and container as described in U.S.
patent 4,279,358. As to the lid, omission of the inwardly
facing shoulder on the inner surface of sidewall 24,
enables the foregoing embodiment of the lid to be molded
more easily, faster and less expensively. As to the
25 container, lip 20 has a much greater radial dimension
which provides a much larger and better shaped surface
over which web segment 26 may contact the lip 20. That
causes a greater stretching force of web segment 26 with
resulting greater surface area of the sidewall which wraps
30 about the lip 20. The more rounded configuration of lip
20 allows web segment 26 to conform more closely to the
shape of the lip. The rounded configuration of lip 20
also facilitates both the removal and the application of
lid 12 to container 10. The greater extent of wrap of web
35 segment 26 around lip 20 and the greater radial dimension
of lip 20 also ensures that the lid will not inadvertently

1 pop off the container. The greater chord length and
greater stretching of web segment 26 allows the container
to accommodate variations in web segment 26 or improper
seating of ring 32 against surface 18 without breaking the
5 seal between the container and the lid.

10 The absence of an inwardly facing shoulder facilitates
application and removal of the lid from the container.
The degree of curvature which may be imparted to the lip
is in part a function of the degree of flexibility and
15 elasticity of the material used for the lid. The softer
or more flexible the lid material, the more it will bend
and the sharper the curve formed by the lip may be and the
greater its permissible radial extent. A stiffer material
will require a more gentle slope or curve on the underside
15 of the lip than a lip with a lesser radial extent.

20 The amount of stretch that may be imparted to the web
segment and the amount of snap the skirt possesses as it
is pushed over the lip during application of the lid is a
function of the elastic memory of the skirt which in turn
25 is proportional to the skirt thickness. It also is a
function of the strength of the skirt relative to the web
segment. If a greater elastic memory or a greater
strength or a tighter seal is desired the skirt may be
provided with a greater radial thickness. The seal may be
improved further by providing the skirt with an inside
25 diameter a few thousandths of an inch less than the
outside diameter of sidewalls 16 of the container. In
this manner, the skirt will snap back against the
container sidewall more quickly and bear against the
30 container sidewall with greater force, providing a tighter
seal by more tightly stretching the web segment over the
lip.

35 By way of example only, the dimensions of a container
and lid described in the foregoing embodiments of this
invention are set forth. It is to be understood, that by
providing such examples, the scope of the invention is in

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1 no way limited. Thus, top wall 22 of lid 12 may have a
thickness of 0.05 inches; lip 20 extends radially
outwardly a maximum distance of 0.145 inches from the
inside wall of container 10; the radius of curvature of
5 lip 20 at its maximum radial extent is .05 inches; lip 20
has an axial extent of about .25 inches; web segment 26
has a radial thickness of 0.015 inches; skirt 28 has a
radial thickness of 0.06 inches or about one half the
thickness of lip 20, and extends outwardly a distance of
10 0.045 inches from the exterior surface of web segment 26;
skirt 28 has a heightwise dimension of approximately 0.125
inches; the entire heightwise dimension of the sidewall 24
is approximately 0.265 inches; and the heightwise
dimension of web segment 26 alone is 0.14 inches.

15 Typically, the lid of this invention is formed of a
low density polyethylene, although other suitably elastic
materials may be used.

20 Container 10, although shown as being cylindrical, may
be a cube, a parallelopiped or any other desired shape.
Mouth 11 may be formed as shown or formed on an axially
extending neck with a cross-sectional dimension less than
that of container 10.

25 FIGS. 7-13 illustrate additional embodiments and
modifications of lids and containers in accordance with
the present invention. In the embodiment of the container
shown in FIGS. 7-9 the rim region 14 of the container
includes an inner lip 60 in addition to the outer lip 62.
The inner lip projects radially inwardly from the
30 container sidewall 64. The inner lip 60 has a downwardly
and inwardly sloping surface 66 which serves as an inner
seat in cooperation with a V-ring formed on the lid, as
will be described. The lower region of the inner lip 60
may slope downwardly and outwardly, as indicated at 68, to
merge smoothly with the inner surface of the container
wall 64. The inner lip may extend downwardly along the
35 container wall to a greater extent than does the outer lip

1 62. The inner lip 60 serves to add substantial hoop
strength to the container, particularly when the container
is held by a bail. Preferably the thickness of the rim is
5 at least substantially equal to or greater than the
thickness of the container sidewall. It also cooperates
with the shape of the outer lip and the configuration of
the lid in a manner which facilitates placement of the lid
on the container.

10 The outer lip 62 has the upper seal surface 70 which,
as shown, extends in a smooth curve from the upper edge 72
of the rim downwardly and radially outwardly. In the
embodiment shown in FIGS. 7-9 the outer lip 62 terminates
in a relatively flat, downwardly facing horizontal ledge
74.

15 The lid illustrated in FIGS. 7-9 is of molded plastic
construction and includes a top wall 76 and a surrounding
sidewall 78 which extends downwardly from the top wall.
As with the previously described embodiment, sidewall 78
20 includes two segments, an upper web segment 80 and a lower
skirt segment 82. The skirt segment 82 is considerably
thicker than the web segment 80 and has a greater elastic
memory. The relatively thinner web segment 80 is more
easily stretched and can be wrapped about the outer lip 62
25 of the container.

30 The embodiment of the lid shown in FIGS. 7-9 has a
shoulder 84 formed at the inwardly facing surface of the
sidewall 78. As shown, the shoulder 84 may define the
transition between the web segment 80 and skirt segment
35 82. The shoulder 84 should be located along the sidewall
78 so that when the lid is pressed onto the container the
shoulder 84 can be advanced downwardly about the outer lip
62 to a location below the underside of the outer lip, as
defined by ledge 74. As will be described in further
detail the shoulder 84 cooperates with the underside 74 of
the outer lip 62 to provide an interlock and assure that
the lid will not be dislodged inadvertently except when

1 its removal is specifically intended. As described in
connection with the previous embodiments the relative
diameters of the outer lip 62 and web section 80 of the
lid sidewall are such that when the web segment 80 is
5 disposed about the outer lip 62 it will wrap about the
outer lip in somewhat of a stretched configuration. Thus,
the inner diameter of the web segment 80 is smaller than
the outer diameter of the outer lip 62. Additionally the
inner diameter defined by the skirt segment 82 of the lid
10 is no greater than the outer diameter of the container
sidewall and preferably may be slightly smaller to provide
an enhanced constricting effect.

15 The lid also includes annular V-ring 86 which is
formed integrally with top wall 76 of the lid and is
located radially inwardly of the sidewall 78. The V-ring
86 includes an inner wall 88 which slopes downwardly and
radially outwardly, and an outer wall 90 which slopes
upwardly and outwardly. The V-ring outer wall 90
generally conforms to the slope of the inner seat 66 on
20 the inner lip 60. The inner and outer walls 88, 90 are
joined at a transition region 92 defined at a bight
between the walls 88, 90. The upper end of the outer wall
90 merges into an annular connecting wall 94. As shown in
25 FIG. 8 the sidewall 78 extends from the outer extremity of
the connecting wall 94. Thus, the outer wall 90 of the
V-ring 86, the connecting wall 94 and sidewall 78 define
an annular channel 96 which is receptive to the rim of the
container as illustrated in FIGS. 9 and 10 and as will be
described. The annular channel 96 is generally tapered
30 from a wider region at its lower end to a more narrow
region at its upper end, at the connecting wall 90. The
lower region of channel 96 defines a channel entry annulus
indicated at the arrow 98 which defines the region through
which the container lip enters into the channel 96. The
entry annulus 98 extends between the outer surface of
35 V-ring outer wall 90 and the closest point on the interior

1 of the sidewall 78 which, as shown, is the inner surface
of the shoulder region. In the preferred embodiment the
entry annulus 98 is smaller than the corresponding
radially measured thickness of the lipped container rim.
5 When the lid is fitted onto the container the sidewall 78,
including its web and skirt segments 80, 82, as well as
the V-ring outer wall 90 flex so as to receive the lipped
rim of the container. The lid components flex so as to
enlarge the channel entry annulus 98. In this regard it
10 should be noted that the generally upwardly tapering
cross-sectional shape of the container rim, as defined by
the inner lip 60 and/or outer lip 62 forms a generally
wedge shape which facilitates progressive enlargement of
the channel entry annulus 98 and smoothly and temporarily
15 distorting the V-ring outer wall 90 and sidewall 78.

FIG. 9 illustrates the lid and container of FIG. 8 in
a seated, interlocked and sealed configuration. As
illustrated, the web segment 80 has a significant portion
which wraps about the outer lip in snug conformity and
20 contact with a significant portion of the upper sealing
surface 70. FIG. 9 illustrates the region of snug
wrapping contact along a band indicated generally by the
region 100. As described previously in connection with
other embodiments of the invention, the constricting force
25 of the skirt segment 82 secures the skirt 82 about the
container sidewall, below the outer lip 62 to maintain the
web segment 80 in its wrapped, sealed relation about the
outer lip 62.

It should be noted that a high degree of effective
30 sealing may be obtained without requiring full wrapping
contact of the web segment about the full outer surface of
the outer lip 62. By providing a band along which the
seal is made, substantially greater seal surface contact
is made than is the case with most containers which, at
35 best, provide little more than a sealing line rather than
a distinct band.

1 Among the further advantages of the invention is that
the lid and container lip may be molded with a relatively
wide range of tolerances without adversely affecting the
quality and effectiveness of the seal. Thus, as can be
5 seen from FIGS. 9 and 10 the annular channel 96 may be
dimensioned to have a vertical height somewhat greater
than the vertical height of the outer lip 62. When the
lid is on the container, as shown in FIG. 9, the
connecting wall 94 may be spaced somewhat from the upper
10 edge 72 of the rim thereby leaving the uppermost region of
annular channel 96 unoccupied. The additional unoccupied
region of annular channel 96 provides for a certain amount
of tolerance between the lid and container. When the lid
is fitted onto the container the skirt and web segments
15 will assume the configuration illustrated in FIG. 9 thus
effecting the seal. By providing the additional vertical
height to the annular channel 96 the precise location of
the shoulder is less critical. This may be seen from FIG.
10 which illustrates the container and lid of FIG. 9 but
20 with the lid pressed down more forcefully over the
container rim. Although, as shown in FIG. 10, that causes
the shoulder to separate somewhat from the bottom of the
outer lip 62, the sealing bands 100 still is maintained.
Thus, the skirt continues to maintain its constricting
25 effect which continues to cause the wrapped sealed
configuration of the web about the outer lip. Thus, the
foregoing configuration assures that an effective seal
will be made and will not be disrupted even if the lid and
container are subjected to rough handling.

30 It may be noted from FIG. 10 that the sealing band 100
has shifted somewhat from its relative location
illustrated in FIG. 9. That results from a tendency of
35 web segment 80 and V-ring outer wall 92 to be further
wedged apart by the generally wedged shape of the
container rim. In this regard it should be noted that the
taper of the annular channel 96 preferably is somewhat

1 1 ss than the general wedge or taper defined by the rim of
the container. As the parts are progressively mated the
generally wider wedge defined by the rim will tend to
spread apart the relatively narrower wedge defined by the
5 annular channel 96. This has been found to tend to cause
the sealing band 100 to shift positions more upwardly
along the upper sealing surface 76. The seal is not
disrupted or broken but, instead, is merely shifted
thereby enabling the container and lid to be subjected to
10 varying loads and a wide variety of conditions which,
instead of breaking a seal, merely shift it to a different
but continuous location.

15 It also should be noted that the relative sizes of the
wedge on the container rim and the wedge defined by the
annular channel also are such as to cause the lid and
container to tend to assume the configuration shown in
FIG. 9. Thus, even if the lid is forced down to the
position shown in FIG. 10, when released the V-ring outer
20 wall 90 will tend to re-expand somewhat and in cooperation
with the web segment 80, will tend to pinch the wedge-like
rim to tend to cause the lid to rise upwardly. That, in
turn, tends to draw the lid to the configuration shown in
FIG. 9 in which the shoulder is in proximity to or engaged
with the ledge 74 thereby preventing further rise of the
25 lid.

30 The V-ring, and particularly its outer wall 90,
maintains contact with the inner seat 66 of the inner lip
60. Although that does provide an additional sealing
region, the primary seal of the invention is effected
along the band contact between the web segment and the
outer lip. The cooperation between V-ring outer wall 90
and inner seat 66, however, serves to substantially
increase the hoop strength of the combined container and
35 lid. That is a particularly important advantage when the
container is used in environments where rough handling may
be expected, such as with paint cans.

1 FIGS. 11-13 illustrate another modification to the
invention in which a supplemental seal is included. In
.. this embodiment a resilient compressible gasket 102 is
located along the upper region of the annular channel 96.
5 The gasket 102 may be formed from a foam plastic material
which may be in the form of a foam plastic O-ring or which
may be extruded directly into the upper region of the
annular channel 96. The gasket 102, annular channel 96
and container rim are of a configuration such that when
10 the lid is in its normal secured position on the
container, such as the configuration shown in FIG. 9 and
illustrated again in FIG. 13, the gasket 102 will be
partially compressed against the upper edge 72 of the
15 rim. As shown in FIG. 12, the gasket also should be
compressible even further such as when the lid is forced
down fully over the container, as described above in
connection with FIG. 10.

20 Thus, I have defined my invention and its various
aspects and embodiments. It should be understood,
however, that the foregoing descriptions of the invention
are intended merely to be illustrative thereof and that
other embodiments and modifications may be apparent to
those skilled in the art without departing from its spirit.

25 Having thus described the invention what I desire to
claim and secure by letters patent is:

CLAIMS

1 1. A lid for a container having a sidewall, a mouth
2 disposed at the upper end of the sidewall, and a lip
3 extending about the periphery of the container mouth, said
4 lid comprising:

5 a top wall;

6 a relatively thin resilient sidewall web segment
7 depending downwardly from said top wall and being
8 stretchable heightwise and expandable radially; and

9 a skirt integral with and extending downwardly from
10 the lower edge of said web segment, said skirt being
11 thicker than said web segment and displaying a greater
12 resistance to radial and heightwise expansion and greater
13 elastic memory than said web segment;

14 the inner diameter of said web segment being no more
15 than the inner diameter of said skirt, the inner surfaces
16 of said skirt and said web segment forming a continuous
17 and uninterrupted inner sidewall surface;

18 said web segment being stretchable heightwise to
19 enable it to wrap snugly and sealingly around the outer
20 surface of said container lip when said lid is applied to
21 said container, said skirt being constructed to retain the
22 stretched web segment in sealing engagement with said
23 container lip when said lid is applied to said container
24 mouth with said skirt against said container sidewall.

1 2. A lid as defined in claim 1 wherein the inner
2 diameter of said skirt is substantially equal to the outer
3 diameter of said container sidewall.

1 3. A lid as defined in claim 2 formed from low to
2 medium density polyethylene, said web segment being of the
3 order of 0.015 inches thick and said skirt being of at
4 least 0.06 inches thick.

1 4. A lid as defined in claim 1 wherein said lid
2 further comprises a sealing ring molded integrally with

3 and depending from the underside of said lid, said sealing
4 ring being dimensioned to seat against an interior surface
5 of said container mouth.

1 5. A lid as defined in claim 1 wherein said inner
2 sidewall surface is a generally cylindrical surface.

1 6. A lid as defined in claim 5 wherein said inner
2 sidewall surface is a right cylindrical surface.

1 7. Apparatus for sealing a wide mouth container with
2 a lid comprising, in combination:

3 a container sidewall, the upper end thereof defining
4 the boundary of said container mouth;

5 an outwardly protruding lip at the upper end of said
6 container sidewall and extending around the entire
7 perimeter of the container mouth;

8 said lid having a top wall and a lid sidewall secured
9 to and depending downwardly from the periphery of said top
10 wall of said lid, said lid sidewall having a smooth,
11 shoulderless inner surface facing said container sidewall,
12 said lid sidewall comprising:

13 a thin, elastic web segment stretchable in a
14 heightwise direction; and

15 a lower skirt portion formed integrally with and
16 disposed below said web segment, said skirt
17 having a thickness and resistance to heightwise
18 and radial stretching greater than said web
19 segment, said skirt having a lower portion
20 adapted to be forced over said lip of said
21 container;

22 said lid being adapted to be snap-fitted over said
23 container mouth by forcing said sidewall over said lip of
24 said container, to expand said skirt radially outwardly,
25 said skirt being adapted to contract radially inwardly
26 toward said container sidewall after passage over said lip
27 to stretch said web segment heightwise and to deform said
28 web segment to cause said web segment to closely conform
29 to the shape of said lip and to wrap sealingly around the

30 outer surface of said lip, said skirt being contracted
31 below the lip to retain said web segment in sealing
32 engagement with said container lip.

1 8. Apparatus as defined in claim 7 further
2 comprising a depression disposed immediately below said
3 container lip in said container sidewall for seating of
4 said skirt therein.

1 9. Apparatus as defined in claim 7 wherein the
2 underside of said lip facing away from the mouth of said
3 container has a sharply angular cross-sectional profile.

1 10. Apparatus as defined in claim 7 wherein said lip
2 is provided with a smoothly curved cross-sectional profile
3 and slopes downwardly away from said container mouth, said
4 lip extending outwardly away from said container sidewall
5 a distance at least twice as great as the thickness of
6 said skirt.

1 11. Apparatus as defined in claim 7 further
2 comprising a sealing ring molded integrally with and
3 depending from the underside of said lid, said sealing
4 ring being adapted to seat against an interior surface of
5 said container mouth when said lid is fitted onto said
6 mouth of said container.

1 12. Apparatus as defined in claim 7 or 11 further
2 comprising radially extending ribs formed on a bottom wall
3 of said lid.

1 13. Apparatus as defined in claim 7 wherein the lower
2 portion of the skirt is rounded.

1 14. In a container having a sidewall and a rim at the
2 upper end of the sidewall, the rim defining the mouth of
3 the container, an improved rim construction comprising:

4 said rim being formed integrally with the container
5 sidewall, the rim having an upper edge and an outer lip
6 which extends radially outwardly, the outer lip having a
7 maximum diameter;

8 the outer lip having an upper sealing surface which
9 extends downwardly and outwardly from the upper edge of

10 th rim to the maximum diameter of the outer lip;
11 said lip having a lower surface which extends from the
12 maximum diameter to the container sidewall, said lower
13 surface defining a sharper, more abrupt transition back
14 toward the sidewall than that defined by the upper sealing
15 surface.

1 15. A container as defined in claim 14 wherein the
2 upper sealing surface of the outer lip progressively
3 enlarges in diameter as it extends downwardly and
4 outwardly from the upper edge of the rim to the maximum
5 diameter of the outer lip.

1 16. A container as defined in claim 15 wherein the
2 upper sealing surface is curved in a downwardly and
3 outwardly convex configuration.

1 17. A container as defined in claim 16 wherein the
2 lower surface merges smoothly with the container sidewall
3 and with the upper seal surface.

1 18. A container as defined in claim 16 wherein the
2 lower seal surface is substantially flat and makes a sharp
3 angular transition at its juncture with the maximum
4 diameter of the lip and at its juncture with the container
5 sidewall.

1 19. A container as defined in claim 14 further
2 comprising:

3 the rim having an inner lip which extends downwardly
4 and inwardly from the upper edge of the rim to define a
5 downwardly and inwardly sloping surface;

6 said inner and outer lips defining a thickened rim.

1 20. A container as defined in claim 19 wherein the
2 combined thickness of the inner and outer lips is
3 substantially equal to at least twice the thickness of the
4 sidewall of the container.

1 21. A container as defined in claim 19 further
2 comprising:

3 said inner lip defining a minimum diameter which is
4 smaller than the inside diameter of the container wall,

5 the lip having a lower surface which extends outwardly
6 from the minimum diameter and which merges with the inner
7 surface of the container wall.

1 22. A container as defined in claim 21 wherein the
2 transition of the inner lip is at a less sharp angle than
3 the transition of the lower surface of the outer lip.

1 23. A container as defined in claim 19 wherein the
2 upper seal surface is curved smoothly and extends in a
3 downwardly and outwardly direction.

1 24. A lid for a container having a sidewall, a mouth
2 disposed at the upper end of the sidewall, and the lip
3 extending about the periphery of the container mouth, said
4 lid comprising:

5 a top wall;

6 a relatively thin resilient sidewall web segment
7 depending downwardly from said top wall and being
8 stretchable heightwise and expandable radially;

9 a skirt integral with and extending downwardly from
10 the lower edge of said web segment, said skirt being
11 thicker than said web segment and displaying a greater
12 resistance to radial and heightwise expansion and a
13 greater elastic memory than said web segment;

14 said web segment being stretchable heightwise to
15 enable it to wrap snugly and sealingly around the outer
16 surface of said container lip when said lid is applied to
17 said container, said skirt being constructed to retain the
18 stretched web segment in sealing engagement with said
19 container lip when said lid is applied to said container;

20 the lid having a seating ring formed therein and
21 extending downwardly from the top wall radially inwardly
22 of the sidewall, the seating ring having an outwardly
23 facing surface which cooperates with the inwardly facing
24 surface of the sidewall to define a channel receptive to
25 the container rim, said channel having a width which is
26 less than the thickness of the rim at the point of maximum
27 diameter of the rim;

28 the diameter d defined by the web segment being less
29 than the outer diameter of the rim whereby when the
30 container lid is advanced onto the container rim, the web
31 segment of the lid will be wrapped at least partly about
32 the rim to form a band of sealing contact between the web
33 segment and the lip.

1 25. A lid as defined in claim 24 further comprising a
2 shoulder formed at the inner surface of the sidewall and
3 being adapted to engage the underside of the lip.

1 26. A container lid as defined in claim 24 wherein
2 said seating ring further comprises:

3 a V-shaped ring formed integrally with and extending
4 downwardly from the top wall, the V-shaped ring having an
5 outer wall which faces and defines said channel, the slope
6 of the V-ring outer wall being downwardly and inwardly so
7 as to define a wedge-shaped channel.

1 27. A lid as defined in claim 26 further comprising a
2 shoulder formed at the inner surface of the sidewall and
3 being adapted to engage the underside of the lip.

1 28. A lid as defined in claim 26 wherein the angle of
2 the wedge shaped channel in the lid is less than the wedge
3 angle defined by the container rim.

1 29. A lid as defined in claim 24 further comprising a
2 compressible gasket disposed at the upper end of the lid
3 channel to engage the upper edge of the rim and being
4 constructed and arranged as to effect a supplemental seal.

1 30. In a container and lid therefor, the container
2 having a sidewall and a rim at the upper end of the
3 sidewall, the rim defining a wide mouth for the container,
4 said apparatus comprising, in combination:

5 said rim being formed integrally with the container
6 sidewall, the rim having an upper edge and an outer lip
7 which extends radially outwardly, the outer lip having a
8 maximum diameter;

9 the outer lip having an upper sealing surface which
10 extends downwardly and outwardly from the upper edge of

11 the rim to the maximum diameter of the outer lip;

12 said lip having a lower surface which extends from the
13 maximum diameter to the container sidewall, said lower
14 surface defining a sharper, more abrupt transition back
15 toward the sidewall then defined by the upper sealing
16 surface;

17 said lid including a top wall and a sidewall extending
18 downwardly from the periphery of the lid;

19 said sidewall including a relatively thin resilient
20 sidewall web segment depending downwardly from said top
21 wall and being stretchable heightwise and expandable
22 radially;

23 a skirt integral with and extending downwardly from
24 the lower region of said web segment, said skirt being
25 thicker than said web segment and displaying a greater
26 resistance to radial and heightwise expansion and a
27 greater elastic memory than said web segment;

28 said web segment being stretchable heightwise to
29 enable it to wrap snugly and sealingly around the upper
30 sealing surface of said container lip when said lid is
31 applied to said container, said skirt being constructed to
32 retain the stretched web segment in sealing engagement
33 with said container lip when said lid is applied to said
34 container;

35 the diameter defined by the web segment being less
36 than the outer diameter of the lip whereby when the
37 container lid is advanced out to the container rim, the
38 web segment of the lid will be wrapped at least partly
39 about the rim to form a band of sealing contact between
40 the web segment and the upper sealing surface of the lip.

1 31. A container and lid as defined in claim 30
2 further comprising:

3 the container rim having an inner lip which extends
4 downwardly and inwardly from the upper edge of the rim to
5 define a downwardly and inwardly sloping surface;

6 said lid further comprising a V-shaped ring formed

7 integrally with and extending downwardly from the lid top
8 wall, the V-shaped ring having an outer wall which slopes
9 downwardly and inwardly so as to substantially correspond
10 to the downwardly and inwardly inclined slope of the inner
11 lip;

12 said V-ring and container inner lip being constructed
13 and arranged as to mate with each other when the lid is in
14 place on the container.

1 32. Apparatus as defined in claim 31 further
2 comprising:

3 a shoulder formed at the inner surface of the sidewall
4 and being adapted to engage the underside of the outer lip.

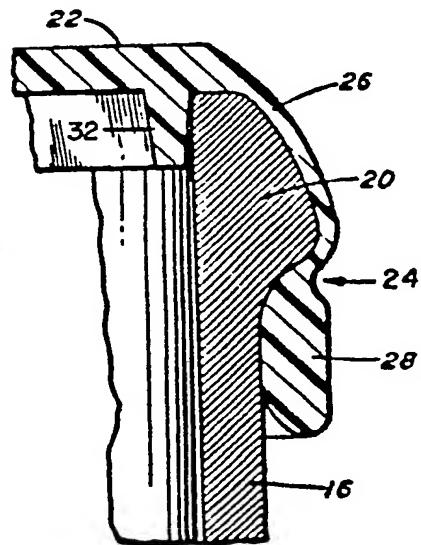
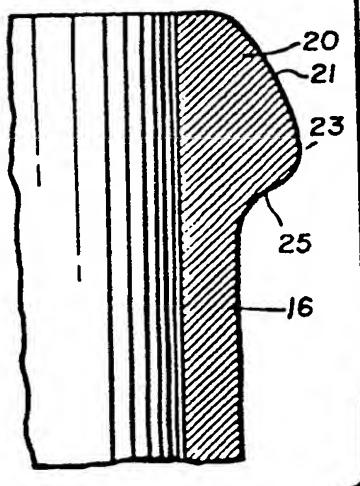
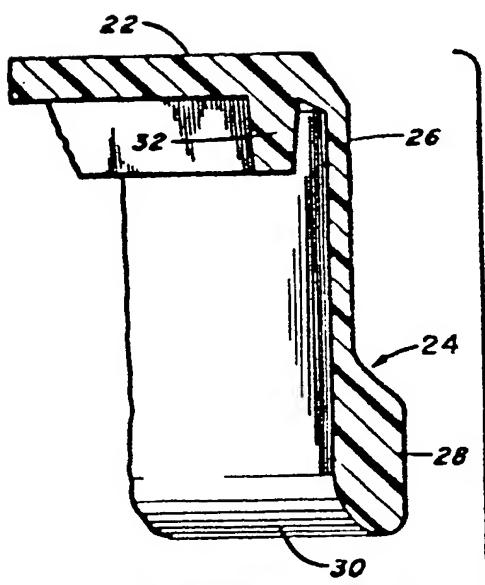
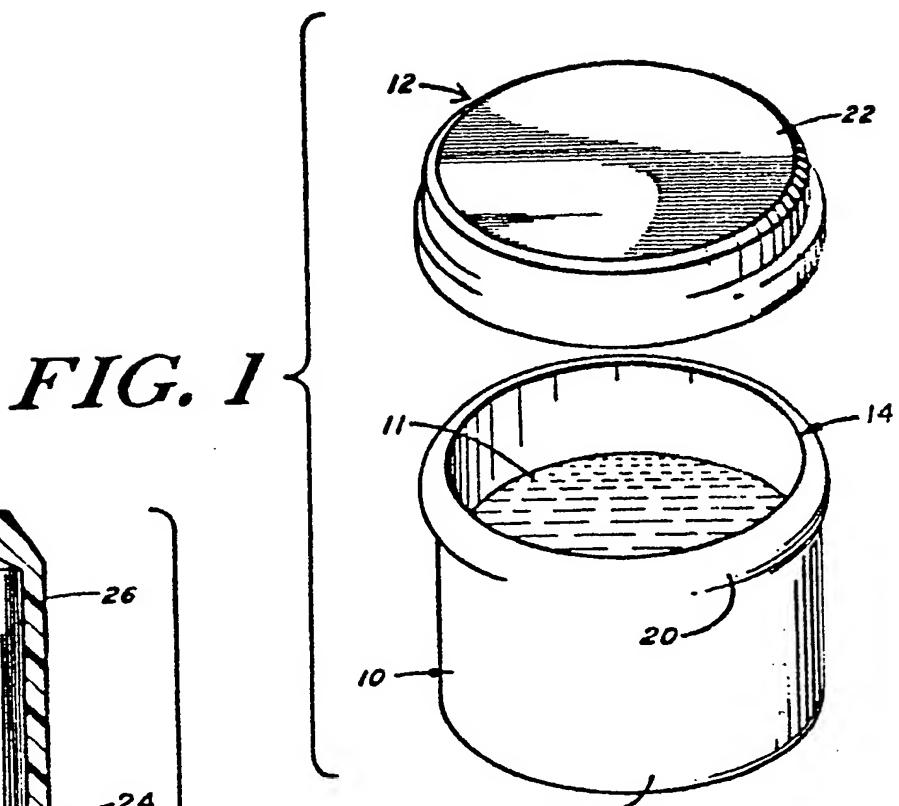
1 33. Apparatus as defined in claim 31 wherein the
2 outer wall of the V-shaped ring and the lid sidewall
3 define a channel receptive to the container rim;

4 a compressible gasket disposed within the lid channel
5 and located to engage the upper edge of the rim when the
6 rim is inserted into the channel, the gasket being
7 constructed and arranged as to effect a supplemental seal
against the upper edge of the rim.

1 34. Apparatus as defined in claim 31 wherein the
2 outer wall of the V-shaped ring and the lid sidewall
3 define a wedge-shaped channel;

4 the container rim being wedge-shaped in cross-section;
5 the wedge angle defined by the wedge-shaped channel in
6 the lid being less than the wedge angle defined by the
7 container rim.

1 / 4



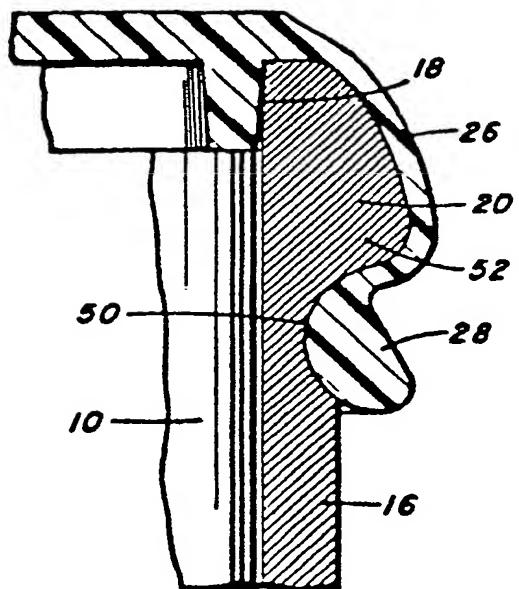


FIG. 4

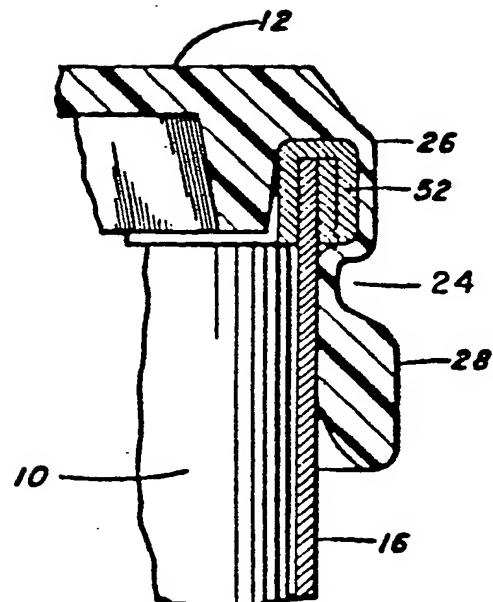


FIG. 5

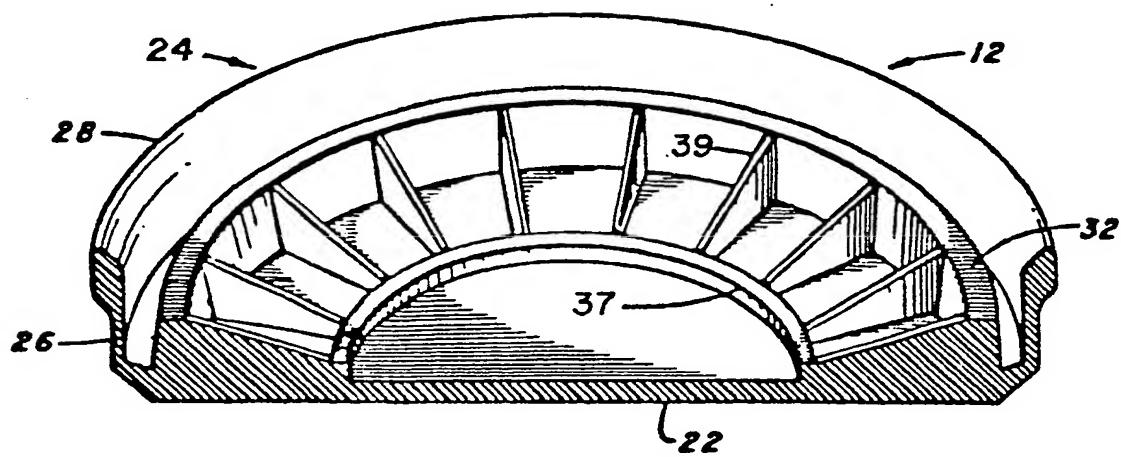


FIG. 6

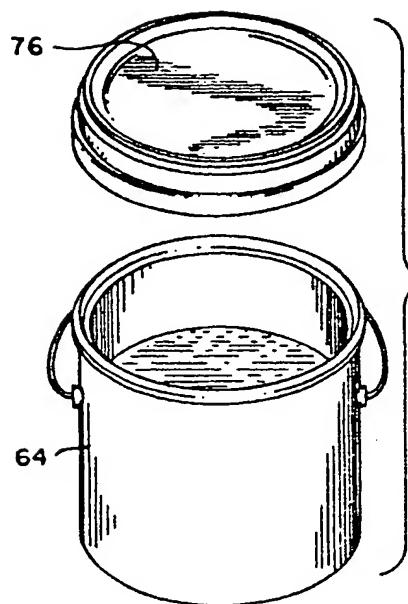


FIG. 7

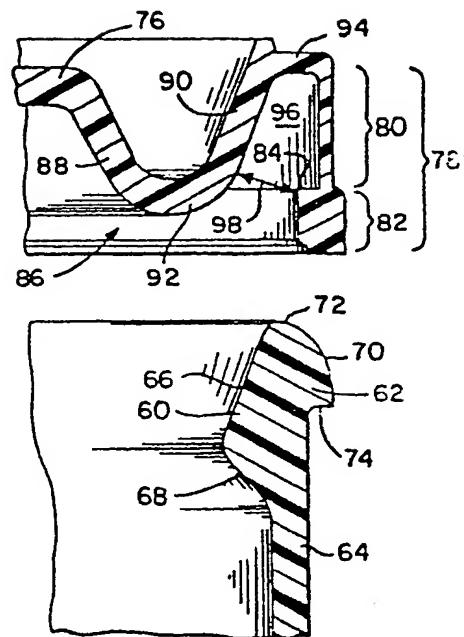


FIG. 8

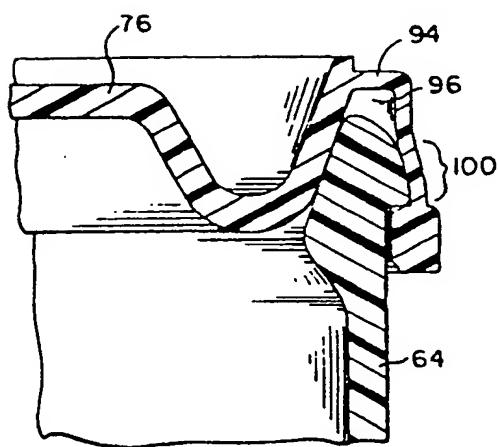


FIG. 9

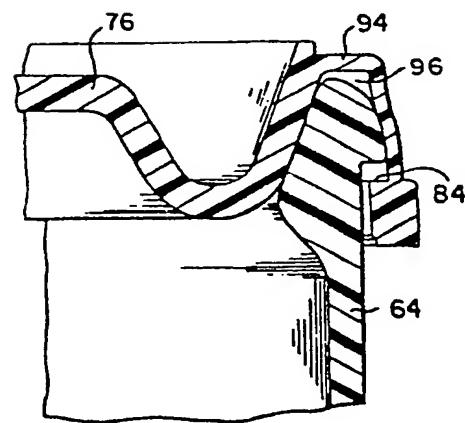


FIG. 10

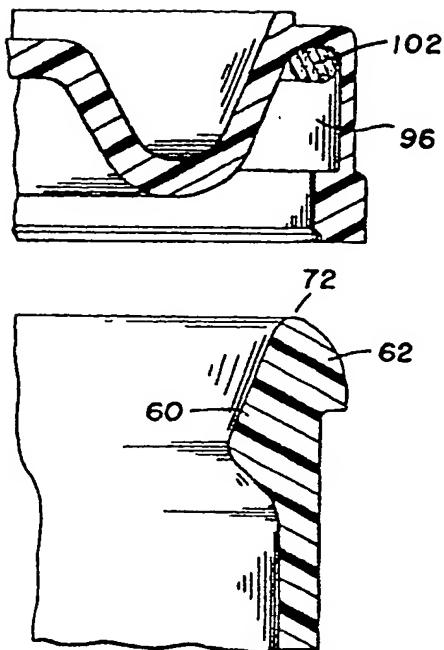


FIG.11

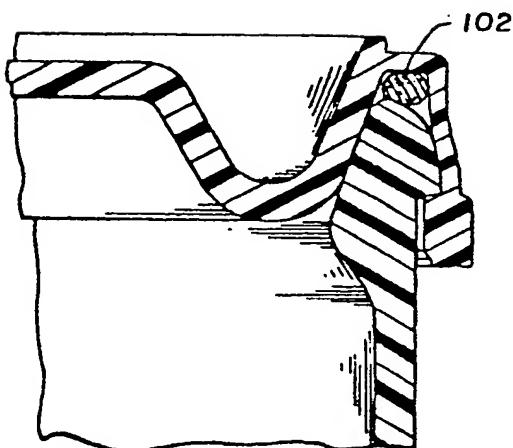


FIG.12

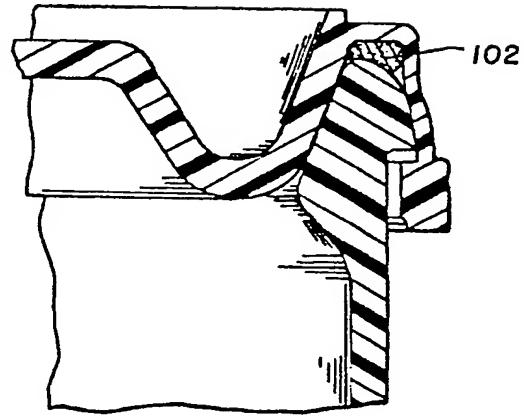


FIG.13